from Trichinopoly. The greater part of those from Pondicherry appear to be undescribed forms. Accompanying the very remarkable assemblage of molluscan genera at the latter locality was a single vertebrata of a Saurian, which Professor Owen regards as most nearly resembling that of *Monosaurus*.

Mr. Kaye presented to the Society a series of the fossils from the several beds, all in the most beautiful state of preservation.

MISCELLANEOUS.

On the production of Animalcules in great numbers in the Stomach and Intestines during the digestion of herbivorous and carnivorous Animals. By MM. Gruby and Delafond *.

In 1685 Leuwenhoeck first discovered three species of microscopic animalcules in the excrements of frogs †; Bory de Saint Vincent, Müller, and Ehrenberg have also ascertained the presence of animalcules in the excrements of salamanders ‡. Leuwenhoeck relates that he saw three species of infusoria in the excrements of pigeons, of chickens, and even of man; but a doubt was thrown upon this last discovery by other observers, and particularly by Ehrenberg.

Up to the present time no observer has proved the existence of living animalcules in the stomach and during the digestion of the superior animals. We shall now present to the Academy the observations which we have been making upon this subject for more than a year, reserving the communication of fuller details until we shall have the honour of laying before it the numerous researches which we have made concerning digestion.

1. The ruminating animals have, during the act of digestion, four species of living animalcules in the first and second stomachs.

First species.—Form long and flattened; the body provided with a granulated carapace which is convex above, flattened beneath, and indented towards its posterior part; head distinct; a girdle of vibrating cilia near the middle of the body; a long, conical, and mobile tail; motions of the vibrating cilia rapid; motions of the body slow; length nearly $\frac{1}{4}$th of a millimetre; width $\frac{1}{8}$th of a millimetre. This animalcule has no analogy with those already known.

Second species.—Form ovoid; body covered with a carapace indented anteriorly and posteriorly; a conical tail; a circlet of vibrating cilia at the anterior part of the body; movements very distinct; length $\frac{1}{20}$th of a millimetre, breadth $\frac{1}{30}$th. This species has some analogy with the *Brachionus polycanthus* of Ehrenberg §.

Third species.—Form elongated and cylindrical; a smooth carapace; no tail; vibrating cilia around the mouth; movements very rapid; length $\frac{1}{30}$th of a millimetre, breadth $\frac{1}{30}$th.

* From the Comptes Rendus de l'Académie for Dec. 11, 1843.

† Anat. et Contempl., 1685, p. 38.

‡ Die Infusionsthierchen, p. 331; Leipzig, 1838.

§ Ehrenberg, *loc. cit.* p. 501.

This species has some resemblance to the *Enchelis nebulosa* of Ehrenberg, which M. Gleichen observed in an infusion of barley.

Fourth species.—Form oval; no carapace; vibrating cilia over the whole surface of the body; buccal orifice at one of the extremities; very rapid rotatory movements; length $\frac{1}{12}$th of a millimetre, breadth $\frac{1}{20}$th. This species has a great analogy with the *Leucophrys anodontæ* of Ehrenberg, and which M. Müller observed in the water of the *Mytilus edulis* *.

The carapace, or transparent envelope of these animalcules allows the alimentary molecules by which they are nourished, and which render their bodies more or less opake, to be recognised in their interior.

The number of these animalcules is so considerable, that, in 5 centigrammes of alimentary matters taken from the first two stomachs of the sheep, for example, there are from fifteen to twenty of different species and various sizes. Considering that all these animalcules are principally composed of fibrin and albumen, we may reckon that the weight of the fifteen to twenty of them existing in every 5 centigrammes of stomachal liquid constitutes nearly the fifth part of the total weight of the liquid in which they live. Now sheep have, on an average, 3 to 5 kilogrammes of food in the first and in the second stomach after an ordinary repast; the total weight of the animalcules contained in these two stomachs will therefore be the fifth part, or from 600 to 1000 grammes.

In the third, and especially in the fourth stomach, these animals are dead, and are only to be recognised by the form of their carapace, which is then quite empty and transparent. As to those animalcules which possess no carapaces, not any trace of them can be detected.

In the small and in the large intestines we find only some fragments of carapaces.

2. The *Horse* has seven species of animalcules, in the cæcum and the dilated portion of the colon.

First species.—Form elongated and conical at its anterior part; head rather indistinct; the posterior part of the body terminated abruptly; without a tail; carapace granulated; two anterior members short, articulated, mobile, terminated by natatory filaments; movements slow and resembling those of the tortoise; length $\frac{1}{8}$th of a millimetre, breadth $\frac{1}{10}$th.

Second species.—Form elongated and somewhat flattened; a distinct head; a granulated carapace; body provided with four articulated members on its lateral parts, two of which are anterior and two posterior, all bearing fasciculi of natatory filaments; circlet of vibrating cilia at the posterior part of the body; movements slow; length $\frac{1}{16}$th of a millimetre, breadth $\frac{1}{30}$th.

Third species.—Form ovoid; carapace granulated; a bundle of vibrating cilia at the anterior and posterior parts, both on the right and left of the body; the movements are slow; length $\frac{1}{30}$th of a millimetre, breadth $\frac{1}{40}$th.

* Ehrenberg, *loc. cit.* p. 313.

Fourth species.—Body of a lengthened ovoid form; its anterior and posterior parts furnished with vibrating cilia; movements slow; length $\frac{1}{300}$th of a millimetre, breadth $\frac{1}{600}$th.

Fifth species.—Form spheroidal; vibrating cilia over the entire surface of the body; rotatory movements rapid; $\frac{1}{12}$th of a millimetre in diameter.

Sixth species.—This animalcule has some degree of resemblance to the form of the heart of certain tortoises; carapace flattened and having three notches or indentations, two of which are furnished with bundles formed of large vibrating cilia; breadth $\frac{1}{15}$th of a millimetre.

Seventh species.—A monad of the $\frac{1}{100}$th of a millimetre. The more or less hard and moulded alimentary matters contained in the latter portion of the contracted colon and in the rectum furnish nothing but the carapaces of all these animalcules.

3. The *Dog* has in its stomach two species of *Monads*.

First species.—Body pyriform, ending in a little tail; the upper surface of the body convex, the under flattened; movements very brisk; length $\frac{2}{100}$ths of a millimetre, breadth $\frac{1}{100}$th.

Second species.—Body filiform; the to-and-fro movements performed slowly; length $\frac{1}{200}$th of a millimetre. The duodenum and the anterior third of the middle region of the narrow bowel contain some of these monads. The last third portion, the jejunum, the cæcum, the colon and the rectum, do not furnish any.

4. The *Pig* has but one species of animalcule in its stomach; form flattened, oval; the hinder part ending in a conical tail; the thin edges of the body furnished with vibrating cilia; movements very brisk; length $\frac{2}{100}$ths of a millimetre, breadth $\frac{1}{100}$th. This animalcule greatly resembles the *Monadina* of Ehrenberg.

The small intestines do not contain any of them.

5. The animalcules of digestion are born, live and swim in the acid liquid contained in the stomach. By placing the stomachal matters in glass tubes kept at a constant temperature of from 30° to 35° centigrade, they may be kept alive for two or three hours, and more.

6. The very great number of these animalcules in the first two stomachs of ruminants, the presence of their empty carapaces in the third, in the fourth, and in the excremental matters, their equally great number in the cæcum and dilated colon of the horse, as also the existence of their empty carapaces in the contracted colon and rectum, lead us to conclude that the organic matter of these animalcules is digested in the fourth stomach of the ruminants, that it is absorbed in the contracted colon of the horse, and that in both bowels it supplies an animal matter for digestion.

7. The consequence, then, of this fact is, that although the herbivorous animals, as the sheep and the horse, in a state of nature, take only vegetable matters into their stomachs, nearly a fifth part of these matters is destined to give birth and sustenance to a great number of animals of inferior development, which, digested in their turn, will contribute some *animal matter* to the general nutrition of

these two herbivorous animals; a consequence rendered more probable by the fact, that in the dog and the pig, which feed on both animal and vegetable substances, the animalcules are minute, of one or two species only, and not at all numerous.

DEVELOPMENT AND PROPAGATION OF SERPENTS.

The young, on leaving the egg, usually differ from their parents, besides their size, by a system of colouring more vivid and more contrasted, by a head more blunt and more rounded, by the largeness of the eyes, and by the less perfect state of the epidermis and its appendages. They are, however, provided with teeth perfectly resembling those of the adult, of which they are ready to make use; and the venomous kinds, instructed by instinct with the power of their weapons, alternately elevate and lower their fangs, and defend themselves against attacks with that fury which is innate in their race. It was long believed that the tail of the young was shorter in proportion to the trunk than in the adult, and that this member presented consequently in them a smaller number of subcaudal plates. If this were the case, we must suppose that new plates develope themselves with age; but as the number of plates corresponds to the number of vertebræ, we must equally suppose the production of new osseous pieces, as is seen in the *Julus*, a circumstance little probable in animals so high in the scale of being as those of which we treat. Besides, the researches which I have made on this subject have proved the contrary; since among a great many individuals the young did not show any difference from the adults in the number of plates but what might be considered as accidental. To be sure of the fact, I have repeated these observations on a great number of the most dissimilar species, and have always obtained the same results.

Shortly after their birth, the young Ophidians undergo their first moult. This operation is repeated in our climate, according to the observations of Lenz, five times in the year, viz. every month from the end of April to the beginning of September; whence it results, that there is no casting of the skin during the hybernation. It would be very interesting to know how many moults serpents undergo in warm climates, where the state of sleep does not take place. A state of domesticity, a mode of life little natural to these animals, remarkably influences the functions of the skin, the epidermis of which does not renew itself in fixed and determinate periods; frequently this operation is very long and so painful that the animal suffers much, or it is sometimes followed by death. In order to reject the old epidermis, which begins to detach itself at the head, and especially along the borders of the lips, the serpent passes itself through mosses, grasses, or heath, and contrives, by means of slow and continued movements or frictions, to disengage gradually the exterior layer of the skin, which is already replaced below by a new epidermis. The spoils thus removed are found inverted from one end to the other, forming a sac with a reticulated surface more or less diaphanous, more wide than the body of the snake, because of the dilata-

tion of the membranous intervals, and presenting, with the exception of the mouth and nostrils, no other orifice than the anus; for it is well known that the hemispherical membrane which protects exteriorly the globe of the eye is part of the integuments, and comes off along with the rejected skin. This skin, at first soft, soon dries, and is easily preserved in cabinets; but it is rare to find it entire, because it is often torn in the operation we have described. We possess some specimens of several foreign species which prove that the moulting is produced in the same manner in all serpents.—*From Dr. Schlegel's Essay on the Physiognomy of Serpents, translated by Dr. Traill.*

ON A NEW SPECIES OF HÆMATOZOON, TRYPANOSOMA SANGUINIS. BY M. GRUBY.

This new species of parasite, which is extremely remarkable from its form and its motions, occurs in the blood of living adult frogs during the spring and summer months. Its elongated and flattened body is transparent, and in shape resembling an auger; its cephalic portion terminates in long minute filaments; its caudal portion also terminates in pointed filaments. The length of the animal is from forty to eighty thousandths of a millimetre, its breadth from five to ten: the cephalic filamentary portion is endowed with the greatest mobility; the length of the cephalic filaments is from ten to twelve thousandths of a millimetre; its body is elongated, flattened and dentated like the blade of a saw the whole length of one of its margins; it is smooth, and turned continuously twice or thrice round its axis like a gimblet or corkscrew, for which reason I propose to call this Hæmatozoon *Trypanosoma*.

The locomotion of the *Trypanosoma* is very remarkable; the rapidity with which it moves every part to produce the motion around its longitudinal axis, *i. e.* the boring movement, and then the address which it shows in avoiding every obstacle it meets in its course, is admirable: we may count four revolutions around its axis in a second, or 14,400 in an hour.

When this animal is still, it contracts so as to form a compact and smooth cylinder, one end of which is rounded, while the other terminates in a brush. At first sight it appears to be quite a different animal, so much is its form changed; but on observing it when it is in the act of contracting itself, it is seen to place itself so that the smooth margin of its body shall form the surface and the rounded end of the cylinder, while the appendages are partly inclosed and pressed in the interior of the cylinder, and moreover form with their elongated points the other extremity, which has the appearance of a brush.

The *Trypanosomata* of the blood are not so common as the *Filariæ*; they occur in two or three out of a hundred frogs, and in each drop of blood will be found two or three *Trypanosomata*. They are sometimes met with in the blood of frogs along with *Filariæ*, but these latter are always more numerous. Young frogs have no *Trypanoso-*

mata in the blood; they are more frequently met with in the blood of the females than of males.

These observations, in connexion with those of MM. Valentin* and Gluge†, place beyond doubt the existence of different species of animalcules in the blood of cold-blooded animals. Their peculiar form, and the motions with which they are endued, prove that these animalcules are peculiar to the blood, and not animalcules of some tissue, carried by chance into the current of the circulation; and a proof not less conclusive is, that they are never met with in any solid substance of the animal. The organs of the frogs in which they occur, examined attentively, exhibit no pathological lesion. These animals even present no symptoms whatever of any disease; and as it is ordinarily in the adults that they occur, their presence in the blood must be attributed to a peculiar and physiological state of the animals.—*Comptes Rendus*, No. 20 for Nov. 1843, p. 1138.

* M. Valentin discovered a peculiar Hæmatozoon in the blood of a *Salmo*, which he supposes to belong to the genus *Amoeba* of Ehrenberg.

† M. Gluge observed in the heart of a frog a peculiar animalcule with three lateral appendages. See 'Annals,' vol. x. p. 49, where are also detailed the observations of M. Vogt on *Filaria* in the blood of frogs. The author's paper on *Filariæ* in the blood of a dog will be found at p. 403, vol. xi. —Ed.

METEOROLOGICAL OBSERVATIONS FOR DECEMBER 1843.

Chiswick.—December 1. Overcast: clear. 2. Frosty haze: very fine: hazy. 3. Hazy: cloudy and mild. 4. Drizzly. 5. Cloudy and fine. 6. Clear and fine. 7. Drizzly. 8. Very fine. 9. Foggy. 10. Foggy: fine. 11. Very fine. 12. Dense fog. 13. Foggy: hazy clouds. 14. Clear and fine. 15, 16. Fine, with clouds. 17. Slight haze: clear and fine: foggy. 18. Foggy. 19, 20. Hazy. 21. Overcast. 22. Very fine; thickly overcast. 23. Cloudy and mild. 24. Clear and fine. 25. Hazy: overcast. 26. Drizzly: foggy. 27. Hazy. 28. Cloudy and fine: hazy. 29. Hazy. 30. Overcast: rain. 31. Cloudy: squally with rain.—Mean temperature of the month 2·26° above the average.

Boston.—Dec. 1, Cloudy. 2. Fine. 3. Fine, beautiful halo round the moon eight o'clock P.M. 4. Fine. 5. Cloudy. 6. Fine. 7. Rain. 8. Fine. 9. Fine: rain P.M. 10. Foggy. 11, 12. Cloudy. 13. Foggy. 14. Fine. 15. Fine: rain early A.M. 16. Cloudy. 17. Fine. 18—20. Foggy. 21. Cloudy. 22—24. Fine. 25—28. Foggy. 29, 30. Cloudy. 31. Fine.—N.B. This is the driest month since February 1832.

Sandwick Manse, Orkney.—Dec. 1, 2. Cloudy. 3. Drizzle. 4. Fine. 5, 6. Heavy showers. 7. Rain: showers. 8. Showers: clear. 9. Cloudy. 10, 11. Cloudy: clear. 12. Clear. 13. Cloudy. 14. Cloudy; heavy showers. 15, 16. Showers. 17. Drizzle. 18. Showers. 19. Cloudy: fine. 20. Fine. 21. Fine: cloudy: fine. 22. Showers: fair: showers. 23. Showers: fair: damp. 24, 25. Clear; fair. 26. Damp: drizzle. 27. Clear: fine. 28. Clear. 29. Cloudy. 30. Rain: drizzle. 31. Showers; hail-showers.

Applegarth Manse, Dumfries-shire.—Dec. 1. Hoar frost. 2. Thick fog. 3—7. Showers. 8. Fair. 9. Fog and rain P.M. 10—13. Cloudy and rain. 14. Fair. 15. Slight shower. 16. Fair. 17. Fair and fine. 18. Fair though dull: shower P.M. 19. Fair. 20. Showery. 21. Fair, but thick fog. 22. Very wet and stormy. 23. Slight showers. 24. Slight showers A.M. 25. Showers. 26. Rain P.M. 27. Fair, but cloudy. 28. Slight showers. 29, 30. Fair. 31. Rain.

Mean temperature of the month ..... 46°·4
Mean temperature of December 1842 ..... 46 ·05
Mean temperature of spring-water ..... 46 ·1

Meteorological Observations made by Mr. Thompson *at the Garden of the Horticultural Society at* Chiswick, *near London; by* Mr. Veall, *at* Boston; *by the* Rev. W. Dunbar, *at Applegarth Manse,* Dumfries-shire; *and by the* Rev. C. Clouston, *at Sandwick Manse,* Orkney.

Days of Month.	Barometer.							Thermometer.							Wind.				Rain.[a]			
	Chiswick.		Boston. 8½ a.m.	Dumfries-shire.		Orkney, Sandwick.		Chiswick.		Boston. 8½ a.m.	Dumfries-shire.		Orkney, Sandwick.		Chiswick. 1 p.m.	Boston.	Dumfries-shire.	Orkney, Sandwick.	Chiswick.	Boston.	Dumfries-shire.	Orkney, Sandwick.
1843. Dec.	Max.	Min.		9 a.m.	9 p.m.	9½ a.m.	8½ p.m.	Max.	Min.		Max.	Min.	9½ a.m.	8½ p.m.								
1.	30·076	30·034	29·54	30·03	30·05	30·01	29·94	48	27	43	52	35½	45	43	n.	calm	sw.	wnw.	.....	.....	.....	·28
2.	30·215	29·991	29·73	29·98	30·10	29·80	29·98	48	35	34	47	33	47	47	sw.	calm	w.	wnw.	·02	.....	.....	.....
3.	30·368	30·348	29·87	30·19	30·17	29·98	29·94	50	46	40	52	44	49	49½	w.	calm	sw.	w.	·01	.....	.....	·13
4.	30·353	30·276	29·88	30·14	30·00	30·01	29·72	49	45	46	50½	48	45	45½	sw.	calm	w.	s.	·01	.....	.....	·06
5.	30·148	30·084	29·60	29·65	29·75	29·32	29·25	53	38	48·5	50	48	46	44½	sw.	w.	sw.	wsw.	·02	.....	.....	.....
○ 6.	30·358	30·316	29·76	29·91	30·09	29·48	29·78	52	36	43	48	42	43½	47	sw.	calm	w.	w.	.....	.....	.....	·60
7.	30·278	30·073	29·75	29·88	29·80	29·40	29·60	55	47	45	53½	47	50½	46	sw.	calm	sw.	wsw.	·01	·03	0·87	·61
8.	30·212	30·153	29·68	30·04	30·09	29·72	30·02	58	30	46	49	44	45	40	w.	calm	sw	wnw.	.....	.....	.....	·06
9.	30·288	30·270	29·83	30·13	30·10	30·10	30·03	44	34	38	49	46	39	44	sw.	calm	wnw.	se.	·08	.....	.....	.....
10.	30·289	30·247	29·83	30·09	30·10	30·05	29·96	49	36	44	50	47	45½	43	sw.	calm	ese.	calm	.....	·05	.....	.....
11.	30·326	30·257	29·83	30·03	30·15	29·91	30·15	50	28	43·5	49	46	49	44	s.	calm	sw.	sw.	.....	.....	.....	.....
12.	30·434	30·413	30·00	30·25	30·25	30·12	30·00	50	28	42	48½	45	42½	47½	s.	calm	se.	s.	·01	.....	.....	.....
13.	30·427	30·416	30·00	30·18	30·20	29·82	30·03	48	31	35	49	45	50	46	se.	calm	se.	wsw.	·01	.....	.....	.....
☾ 14.	30·490	30·389	30·03	30·19	30·07	29·70	29·63	51	41	37·5	50	47	50	45	sw.	calm	sw.	sw.	.....	.....	0·05	.....
15.	30·353	30·318	29·84	29·95	30·09	29·55	29·82	54	39	37	56	51	40	42	w.	calm	sw.	nw.	.....	.....	.....	·83
16.	30·405	30·333	29·75	30·18	30·22	30·02	32·10	54	38	48	45	39½	38	38½	nw.	calm	sw.	nw.	·04	·04	.....	·18
17.	30·453	30·427	29·93	30·24	30·30	30·10	30·18	54	30	45	...	...	44	47½	w.	calm	w.	s.	.....	.....	.....	.....
18.	30·451	30·437	29·95	30·29	30·32	30·20	30·22	45	40	43	...	...	45½	46	w.	calm	sw.	sw.	.....	.....	.....	·13
19.	30·429	30·422	29·95	30·23	30·23	30·17	30·10	47	42	43	...	...	43½	44	s.	calm	s.	s.	.....	.....	.....	.....
20.	30·399	30·297	29·92	30·15	30·05	30·01	29·88	49	41	44	...	...	43	50½	s.	calm	sw.	se.	.....	.....	.....	.....
● 21.	30·404	30·346	29·88	30·15	30·18	30·00	30·09	50	42	45	...	...	46	44	sw.	calm	se.	w.	.....	.....	0·29	.....
22.	30·400	30·306	29·91	29·95	29·90	29·65	29·48	52	42	45·5	...	...	46	50	s.	w.	s.	sse.	.....	.....	.....	·06
23.	30·364	30·355	29·80	30·12	30·14	29·90	29·94	56	48	49	...	...	46	47½	sw.	calm	sw.	w.	·01	.....	.....	·10
24.	30·483	30·416	29·91	30·16	30·32	30·00	30·12	55	46	51	...	...	51½	49	sw.	calm	sw.	sw.	.....	.....	.....	·12
25.	30·466	30·396	30·04	30·00	30·21	30·10	30·91	52	35	48·5	...	...	47	47½	s.	calm	sw.	sse.	·01	.....	.....	.....
26.	30·370	30·336	30·00	30·22	30·23	30·10	30·10	46	41	43·5	...	...	47	47	se.	calm	sw.	sw.	.....	.....	.....	.....
27.	30·419	30·412	29·96	30·20	30·33	30·11	30·09	45	33	44	57	44	47	48½	w.	calm	sw.	sw.	·03	.....	.....	·12
☽ 28.	30·498	30·476	30·07	30·30	30·31	30·09	30·06	49	42	40	49½	43½	49½	48	w.	calm	sw.	sw.	.....	.....	.....	.....
29.	30·454	30·311	30·00	30·20	30·14	29·98	29·88	45	37	44	49	44	49	50	sw.	calm	sw.	sw.	.....	.....	0·60	.....
30.	30·278	30·195	29·85	30·00	29·80	29·65	29·66	42	39	42·5	49	44½	46½	37	sw.	calm	sw.	nne.	·02	.....	.....	·19
31.	29·979	29·664	29·53	29·55	29·47	29·53	29·41	50	30	41·5	48	42	38	35	sw.	calm	sw.	w.	·30	.....	.....	·23
Mean.	30·351	30·313	29·85	30·082	30·082	29·889	29·937	50·00	34·42	43·2	50	44·1	45·62	45·29					0·58	0·12	1·81	3·70